A GAIT ANALYSIS IN PATIENTS WHO HAVE UNDERGONE A ROTATIONAL ACETABULAR OSTEOTOMY

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**Introduction**

Hip dysplasia has a relatively high prevalence in Japan. Rotational acetabular osteotomy (RAO) is an interventional strategy that seeks to reduce the abnormal high stress concentration in the acetabulum, and thereby preventing the development of coxarthrosis. Good clinical and radiological long-term results of RAO have been reported; however, the change in gait characteristics in patients after undergoing RAO have not yet been clearly elucidated. Particularly, no studies have been performed reporting on observation of periodic changes in the gait characteristics after RAO. In this study, a non-invasive gait analysis technique was used to measure the temporal gait parameters of hip dysplasia patients who underwent RAO in an attempt to identify the time variables with a discriminating power between the postoperative results over time.

**Patients**

Ten patients (all females) who underwent unilateral RAO from May to July 2003 were evaluated using a ground reaction force plate (gait scan 8000; Nitta Inc.) at Saga University Hospital. None of the patients demonstrated any symptoms involving the contralateral hip, lumbar vertebrae, knee, or ankle joints. The mean age of the subjects was 39.3 years (range 12-58 years) at the time of the operation. According to the stage classification for hip osteoarthritis, there were 5 patients in an early stage and 5 patients in an advanced stage. The average center-edge (CE) angle observed in the patients was 5.5 (range -10-15) and the acetabular-head index (AHI) was 56.3 % (range 46.5-68.8 %). Postoperatively, the patients improved an average CE angle of 33.2 (range 25-40) degrees and an AHI of 87.6 % (range 75-95.6 %). According to our critical pathway, full weight-bearing was allowed on the 7th day postoperatively. The operative technique used was identical for all patients.

**Methods**

The gait analysis was performed preoperatively and at 3 weeks, 1, 3, 6, and 12 months postoperatively. All the patients were tested during "free" walking along a 5-m walkway having a ground reaction force plate (gait scan 8000; Nitta Inc.). Their walking was tested for 5 seconds. In this study, the distance factors (stride length, step length) and the temporal factors (the single and double support duration (% cycle), gait speed, walk rhythm) were evaluated. These values were evaluated both pre- and postoperatively. The results were examined and compared with the data of healthy persons reported as by Murray et al.1

**Results**

The gait characteristics were observed to improve to normal level within 1 year after RAO. The step lengths of the involved leg for patients prior to RAO were shorter than that of uninvolved leg. It thereafter increased gradually and reached almost the same length as the uninvolved leg at 6 months. The average value of the stride length for patients prior to RAO was unchanged in comparison to that for healthy persons; however, it decreased at 3 weeks post RAO. It thereafter increased gradually and attained a normal value within 6 months. The average value of single support duration (%cycle) for patients prior to RAO was lower than that for healthy persons. It decreased to about 30% at 3 weeks post RAO. It thereafter increased gradually and attained a normal value within 1 year. (Fig 1) The average value of double support duration (%cycle) for patients prior to RAO was higher than that for healthy persons. It increased to about 121% at 3 weeks post RAO, and thereafter it gradually decreased but then it improved within 6 months postoperatively, finally attaining a normal average value within 1 year post RAO. (Fig 2) The average values of gait speed and walk rhythm for patients prior to RAO were lower than that for healthy persons. It thereafter increased gradually and attained a normal value within 1 year.

**Discussion**

The aim of this study to analyze the distance and temporal gait parameters' evolution in hip dysplasia patients who underwent RAO in an attempt to identify the function in the postoperative results over time. As observed in this study, the gait parameters prior to RAO showed a difference in comparison to the normal average values although many of the patients only complained of hip pain when walking long distances. The preoperative asymmetry between the two legs in single support duration, double support duration and step length is due to the pain and reduced ability of the affect hip to sustain load. At three weeks postoperatively, the pain may have been accentuated while walking. Therefore, the gait characteristics observed in the patients up until 3 weeks postoperatively were similar to those observed in the patients with hip osteoarthritis. Hip pain may increase the pain-induced reflex inhibition of the thigh and gluteal muscles. This so called pain-related arthrogenous inhibition of the muscle functions is thought to contribute to muscle weakness in hip osteoarthritis. Subsequently, the walking pattern gradually attained a normal average value. Postoperatively, the pain decreased and the ability of the affected hip to sustain a load improved, most likely due to a gradual decrease in the hip pain while walking. In addition the patients could therefore gradually obtain a normal walking pattern. The gait characteristics normalized within 1 year post RAO. This gait analysis assigns one successive factor score to each patient, and it can evaluate all patients on the same scale. This gait analysis is thus considered to be useful supplementary analysis which helps to overcome some of the problems in the present clinical evaluation system described above.

**References**


